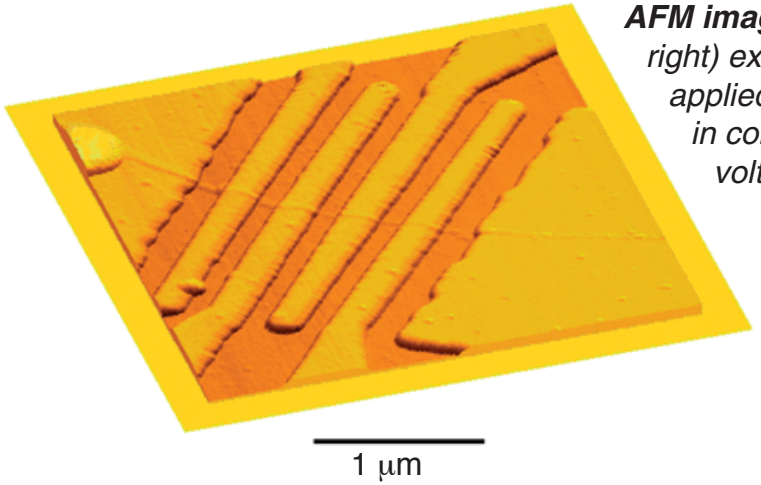
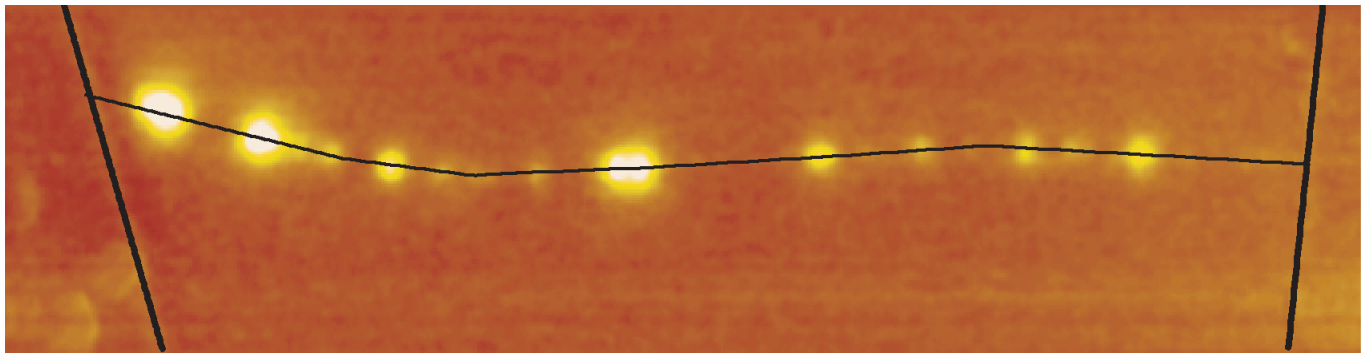
Characterization of the Physics of Electrons □ Confined to One Dimension

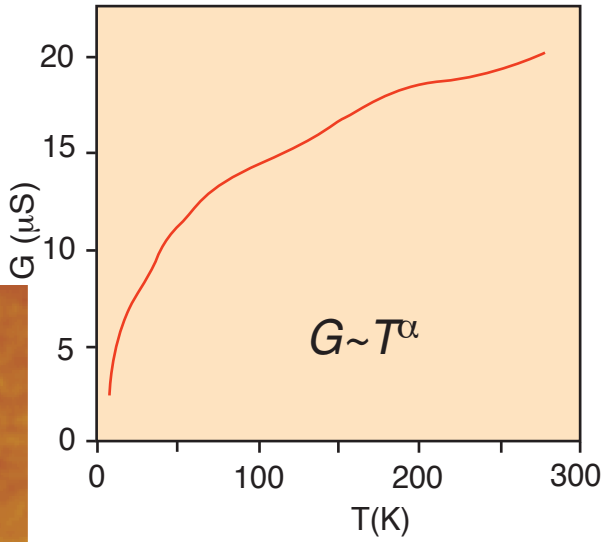
Carbon Nanotubes used to Study Magnetic Properties, Scattering, and Metallic Behavior



AFM image shows "nanotube rope" *(gold line top left to lower right) extended across a series of electrical contacts. Voltage is applied to the contacts, substrate, and/or an AFM tip (not shown) in contact with the rope. The resulting currents and/or induced voltages are measured.*



Conductance in nanotubes. *An AFM tip is used to detect scattering centers that degrade the conductance as current is passed through nanotubes. The thick black lines depict the contacts and the thin black line depicts the location of the nanotube being tested, which is not directly visible in this mode of observation. Bright spots indicate the presence of several scattering centers in the semiconducting tube under test. Such scattering centers are not observed in metallic tubes, which shows that electrons are transported without scattering ("ballistically") along their length.*



Conductance (G) of a metallic nanotube *diminishes as a power-law in temperature as predicted for a "Luttinger liquid," the postulated ground state of the 1-D electron gas. This behavior is the opposite of that of an ordinary metal whose conductance stays constant or increases.*

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